

**NERRS Science Collaborative Progress Report for the Period 09/01/11 through 03/01/12**  
Submitted March 9, 2012

**Project Title:**

Sustaining Coastal Landscapes and Community Benefits:  
Developing an Interdisciplinary Model for Enhancing the Impact of NERRS Science

**Principal Investigator(s):** Dr. Christine Feurt & Dr. Robert Johnston

**Project Investigators Wells NERR Science Collaborative Team**

Dr. Christine Feurt (Science Integrator), Dr. Michele Dionne, Tin Smith, Suzanne Kahn Eder, Jeremy Miller, Jake Aman, Sue Bickford, Annie Cox

**Titles:**

Coastal Training Program Coordinator (CTP), Research Director, Stewardship Coordinator, Education Director, Research Associate, Research Associate, GIS Specialist, CTP Associate

**Project Research Team**

This interdisciplinary team designs and conducts economics, ecological and communication research in collaboration with stakeholders.

Co-Principal Investigator Dr. Christine Feurt, CTP Coordinator, Wells NERR & Director Center for Sustainable Communities University of New England

Co-Principal Investigator: Dr. Robert Johnston, Director, George Perkins Marsh Institute and Professor, Department of Economics Clark University

Dr. Michele Dionne, Research Director, Wells NERR

Dr. Verna DeLauer, Research Scientist, George Perkins Marsh Institute, Clark University

Dr. Mahesh Ramachandran, Research Associate, George Perkins Marsh Institute, Clark University

Mr. Peter Wiley, Economist, NOAA Coastal Services Center

**Project start date: Fall 2010**

**Report compiled by: Christine Feurt and Project Research Team**

For additional information about this project contact Dr. Christine Feurt [cfeurt@wellsnerr.org](mailto:cfeurt@wellsnerr.org)  
Phone 207-646-1555 x 111.

**Contributing team members and their role in the project:**

See above for Wells NERR Science Collaborative Team and Project Research Team composition

**Wells NERR Stakeholder Network** These 18 organizations participated in the development of the proposal. Representative members of the network interacted with the Wells NERR or Project Research Team during this reporting period to provide feedback on research progress and incorporation of results in conservation, management and planning.

1. Maine Association of Conservation Commissions
2. Maine Geological Survey
3. Maine Coastal Program
4. Maine Nonpoint Education for Municipal Officials (NEMO)
5. Maine Sea Grant
6. Maine Drinking Water Program
7. Maine Department of Inland Fisheries and Wildlife, Beginning with Habitat

8. Maine Department of Environmental Protection
9. Maine Department of Marine Resources
10. Southern Maine Regional Planning Commission
11. Mt A to the Sea Conservation Initiative
12. Rachel Carson National Wildlife Refuge
13. University of New England
14. Laudholm Trust
15. Piscataqua Region Estuaries Partnership
16. Town of Wells, Planning Department
17. Town of Sanford, Planning Department
18. Town of Kennebunk, Conservation and Open Space Planning Committee & Planning Department

#### **A. Progress overview:**

##### **Overall Goal of Project**

The proposed project will develop and apply an integrated, spatially-explicit, transdisciplinary framework to characterize and quantify the impact of riparian management on ecosystem services identified as important by Wells NERR stakeholders including land use decision makers, planners and policymakers at state and municipal governmental scales and partner NGOs. Building on ecological models and data available for the Wells NERR, including data in the System Wide Monitoring Program, the project will coordinate economic expertise in ecosystem service valuation with Wells NERR expertise in ecological science to provide defensible estimates of social benefits associated with riparian area management in the Wells NERR region, as realized through changes in ecosystem services. Quantification of values and tradeoffs associated with management alternatives will provide information crucial for policy design and to identify often overlooked benefits of policies to enhance ecosystem sustainability. Integrated components of the proposed project will ensure that science-based results are applied effectively to inform coastal management and land use decisions and that the results are transferrable to other Reserves. Outputs will provide heretofore unavailable mechanisms through which NERRS ecological data can be integrated with economic data and used in coordination with stakeholders to inform coastal management that sustains ecosystem services.

##### **Overall Project Objectives**

- I. Develop a user-inspired, transdisciplinary model to guide sustainable riparian management in the Wells NERR and surrounding watersheds, grounded in geo-spatially explicit quantification of ecological/economic tradeoffs in ecosystem services and values.
- II. Coordinate social science and cognitive theory, principles of effective communication, local motivations for stewardship/conservation, and approaches for social learning to:
  - a. Identify specific stakeholders most influential in affecting decisions, management and policy change affecting Wells NERR riparian areas addressed in Objective I.
  - b. Evaluate Wells NERR communication approaches to these identified stakeholders/stakeholder groups to assess the degree to which messages are in alignment with values and priorities identified in Objective I;
  - c. Develop high impact, science-based communication strategies and decision support tools—based on the ecological/economic results of Objective I—to inform integrated management of riparian area land use, habitat and nonpoint source pollution in watersheds draining into the Wells NERR region.

- III. Engage Wells NERR stakeholders, the Science Collaborative Team and the Project Research Team within a collaborative learning process to build long-term institutional and regional capacity for improved riparian management through a community of practice. Collaborative learning will be grounded in coordinated science, communication and decision support outputs of Objectives I and II.
- IV. Based on results of prior objectives, develop transferable templates for application of developed methods to guide policy development and stakeholder interactions in other Estuarine Reserves. Integrate with NERRS/NOAA to assist in broader adoption.

Focus of Objectives for the period September 2011 – March 2012

### Project Timeline Highlighted for this Reporting Period

Objectives, Products, Activities	Year 1					Year 2					Year 3			
	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4
Objective I: Develop Models Quantifying Ecosystem Services and Values	x	x	x	x		x	x	x	x		x	x		
Objective I: Develop, Test and Implement Choice Experiment; Conduct Ecological Field Campaigns; Finalize Model Linkages			x	x		x	x	x	x		x	x		
Objective I: Data Analysis and Results for Ecological/Economic Models						x	x	x	x		x	x		
Objective II: Communications Audit		x	x	x		x	x	x	x					
Objective II: Mental Models and Test Cases				x		x	x	x	x		x	x		
Objective III: Develop Community of Practice	x	x	x	x		x	x	x	x		x	x	x	x
Objective IV: Develop/Disseminate Decision Support Tools and Transfer Mechanisms											x	x	x	x
Objectives I-IV: Coordinate with Stakeholders	x	x	x	x		x	x	x	x		x	x	x	x

### B. Working with Intended Users:

Interaction with intended users/stakeholders during this period is described below. The collaborative team for this project engages with stakeholders at conferences, workshops, field based trainings, meetings and as members of on-going partnerships such as the Salmon Falls Watershed Collaborative, the Mount A to the Sea Conservation Initiative and the newly formed Southern Maine Water Learning Network and Mobilize Maine Partnership. The events provide opportunities for building trust, creating awareness of the project and staying current on organizational priorities to maintain the relevance of the project and increase the potential for transfer of research findings.

The Research Team members met on March 2 and 5 to review project timeline, evaluate stakeholder input during this period and to adapt methods and timeline based on input. The decision was made to use a combined methodology of paper survey and in person group activities to administer the choice experiment. This will break new methodological ground and provide an innovative way to develop and test the ecosystem service concepts and their values.

Formal evaluations, meeting minutes, participant observation and individual conversations with people in the activities listed below provided input into the project. Members of the project teams use these regular stakeholder interactions to guide the project, build trust and create new partnerships.

## **Presentations, outreach and engagement about ecosystem services, collaborative interdisciplinary research**

Christine Feurt presented, *Sustaining Ecosystem Services in a Changing Climate – A Job Too Big for Science?* Societies, Estuaries and Coasts: Adapting to Change 21st Biennial Conference of the Coastal and Estuarine Research Federation 9 November 2011, Daytona Beach, Florida. Attendees to session: 50 coastal managers and scientists.

Members of Wells NERR Science Collaborative Team conducted, TIDES Field Orientation to the NERRS. Graduate Field-based Seminar for students in UNH TIDES (Training for the Integration of Decision-making and Ecosystem Science) program Wells Reserve Aug 24, 2011. Six UNH graduate students and faculty.

Christine Feurt presented *Collaborative Learning an Expert Practice for Ecosystem Based Management*. Graduate Seminar for students in TIDES (Training for the Integration of Decision-making and Ecosystem Science) program. UNH Durham, NH. November 2, 2011. Ten graduate students.

Christine Feurt presented "*Surprises on the Saco*" *UNE Research reveals ecologically and economically important estuarine biodiversity in Biddeford*. Presentation to Saco River Salmon Club about collaborative research results in the Saco Estuary. October 18, 2011. 40 participants

Christine Feurt presented "*Surprises on the Saco*" *UNE and Wells NERR Research reveals ecologically and economically important estuarine biodiversity in Biddeford*. Presentation about collaborative research results in the Saco Estuary to Biddeford Open Space Committee and other municipal boards (30 participants), televised for public access TV. October 20, 2011. 35 participants.

Kathryn Rosengren presented *Who's Minding the Shore? An Analysis of Riparian Buffer Policy in Southern Maine Coastal Watersheds*. Multiple venues and audiences: November 21, 29, December 8, 2011. Results of policy analysis and stakeholder engagement to evaluate riparian buffer policies. Presentations made to staff at Wells National Estuarine Research Reserve, Salmon Falls Watershed Collaborative and Wells NERR Science Collaborative Research Team. Kathryn was TIDES Graduate Fellow working as an intern on the Wells NERR project. Total audience for all three programs was 40 members of project stakeholder group.

Christine Feurt presented *Sustaining Coastal Landscapes and Community Benefits-Developing an Interdisciplinary Model for Enhancing the Impact of NERRS Science*. Annual Conference of the National Estuarine Research Reserve System. October 25 – 29, 2011 Sawgrass Resort, Jacksonville, Florida. Presentation to NERRS Managers Session and representatives of ERD about the project. Thirty-five participants.

Christine Feurt and Annie Cox represented the Wells NERR at two Mobilize Maine Regional Meetings. November 15, 2011& February 16, 2012 . Economic development initiative for southern Maine business leaders, academics, local governments and NGOs. Sustainability, quality of place and economic development are all part of this strategic initiative. Representatives for southern Maine businesses, financial organizations, municipal government and NGOS are part of this working group.

Annie Cox developed and implemented: *Using 21st Century Stormwater Management and Low Impact Development to Protect Water Quality*. July 26, 2011. Field based workshop developed with stakeholder partner organizations from the Salmon Falls Watershed Collaborative. Workshop included on-site visits to demonstration projects covering Wakefield, Rochester, Somersworth and Portsmouth New Hampshire for federal, state and local governments, watershed professionals, NGOs. 35 participants.

Wells NERR and UNE and stakeholders. *"We're all in the same boat – Smooth Sailing for Collaborative Research on the Saco Estuary"* July 25, 2011 & *"We're All in the Same Boat" How Planning, Restoration, Research and Management are Sustaining the Saco*, August 15, 2011. *Saco Estuary Policy, Science and Stewardship Boat Trips* for stakeholders working in the estuary portion of the Saco in Biddeford and Saco. Stakeholders and researchers are all in the same boat because the work we do, the places we care about and our professional goals are connected to the health of ecosystems. The July and August boat trips on the Saco gave researchers and stakeholders a chance to observe and discuss the way a group of researchers, students, planners, managers and community leaders are collaborating to understand and sustain what they value about the Saco estuary and its watershed.

Stakeholder Communication Training: *Water Words that Work & Combat Communications* workshops August 3 & 4, 2011. Training in science communication, social marketing and development of messages for sustaining water. Audiences engaged: state, federal, local resource managers, policy makers; community and watershed groups; non-profit organizations; business consultants. Presented in partnership with Great Bay NERR. 60 participants.

UNE/ Wells NERR research team and undergraduate *Sustaining Water* class, engage with Peter Taylor of Waterview Consulting to develop communication concept plan and stakeholder focused outreach products to support ecosystem indicator development and public outreach to motivate estuarine stewardship. July, August, October, 2011; January, February 2012, University of New England, Biddeford, Maine.

Feurt, Christine. Moderator of Kennebunk Conservation Commission and Open Space Committee: *Healthy Lawns Healthy Kennebunk*. September 22, 2011. Workshop designed to protect riparian buffer ecosystem services through sustainable lawn care practices for water quality protection. Panelists and participants in workshop included regional businesses, state and local government, and community members. The program continues to be rebroadcast on public access TV in the Kennebunks.

Annie Cox developed and implemented a stakeholder workshop: *Watershed Restoration Field Workshop*. October 5, 2011. Showcase southern Maine watershed restoration efforts in Spruce Creek Watershed, Kittery through Low Impact Development (LID) Technologies and stormwater Best Management Practices (BMPs) and through dam removal and culvert replacement on Shorey's Brook in Eliot. Municipal officials, state and federal resource managers, watershed and community groups. Regional.

Rosengren, Kathryn. Stakeholder engagement with Saco River Corridor Commission. Attend meetings, conduct interviews to inform policy analysis of riparian buffer protection on the Saco. Various times summer 2011. Kathryn is an intern with the Wells NERR working on the policy analysis portion of the project.

Stakeholder engagement workshop: *Conservation Sub-division Workshop with Randall Arendt*, December 5, 2011, Ogunquit, Maine. Planners, municipal land use boards and conservation organizations learn best practices for land use planning.

Stakeholder workshop organized for land conservation stakeholders. Jay Espy of the Sewell Foundation presented, *Effective Practice in Funding Land Conservation for Impact* February 8, 2012. The workshop included a facilitated dialogue about challenges facing conservation organizations in current economic conditions and the importance of building collaborative partnerships that link habitat conservation with community values. Forty participants attended. This group was a key stakeholder group in the development of the proposal for this project and continue to stay engaged as the project progresses.

Southern Maine Water Resources Learning Team October 2011 – February 2012. Members of the Wells NERR Collaborative Research Team participated in a collaborative process consisting of 4 stakeholder meetings to identify and prioritize actions to sustain water resources in southern Maine. The group identified priority goals in alignment with the project objectives for this project. Annie Cox, Tin Smith and Chris Feurt participated in the meetings. The scope and intent of the Science Collaborative project was communicated and identified as important for the group as they move forward in their work.

Social Coast Conference Feb 15 – 16, 2012. Dr Feurt served on the Planning Committee to develop the conference for the period September 2011 – February 2012. In collaboration with three other CTP Coordinators she developed a session presentation about methods used by CTP that contribute to sustaining ecosystem services titled, *Sustaining ecosystem services in a changing climate - a job for social science?* This presentation about use of social science in coastal management and collaborative research within the National Estuarine Research System included this project as a case study. Dr. Feurt also organized a session of Social Coast, *Evaluating Social Science Contributions to Increase Impact of NERRS Science*. This session used graphic facilitation to engage conference participants in a discussion about the barriers, challenges and benefits of using the results of biophysical monitoring and research integrated with policy analysis tools to evaluate the effectiveness of adaptive ecosystem management, regulations, and policies aiming to sustain ecosystem services. Dr. Mahesh Ramachandran presented three sessions as part of a social science methods roundtable for coastal managers and researchers. He highlighted Stated Preference Methodology and described how it is being used in the Wells NERR project. Peter Wiley presented a facilitated discussion session with Dr. Linwood Pendleton that focused on Economic Value of Ecosystem services.

Rob Johnston presented "Choices & Tradeoffs - Quantifying the Economic Value of Natural Resources and Services for the National Estuarine Research Reserves" February 28, 2012. A national webinar introducing the concepts, principles and practices of economic valuation using stated preference methods at Wells NERR. Dr. Feurt presented introduction to the way this methodology is being employed in southern Maine Watersheds included in the Wells NERR.

#### C. Progress on project objectives for this reporting period

**Objective 1.** Develop a user-inspired, transdisciplinary model to guide sustainable riparian management in the Wells NERR and surrounding watersheds, grounded in geo-spatially explicit quantification of ecological/economic tradeoffs in ecosystem services and values.

*Task I.1. Develop Ecological Scenarios and Characterize Biophysical Status, Trends and Responses.*

The overall goal of the ecology portion of this project is to determine the influence of forested riparian buffer on aspects of stream ecology – specifically nitrate and ammonium inputs and water column concentrations; water temp, pH, turbidity and level; algal cover on substrates; stream macro invertebrates; in-stream fish habitat, in-stream flows, and fish.

We accomplished all of our planned work for the 2011 field season: 1) identifying and receiving permission to access 20 field sites, 2) deployment, collection and processing of long-term nitrogen nutrient collectors just subsurface in the streamside soils in our 20 sampling sites (5 open and forested pairs in each watershed), 3) concurrent deployment of 2 YSI 6600-V2 water quality data loggers with nitrate probes for 24-72 hours at each paired site; and for the same 3 paired sites in each subwatershed (Merriland River and Branch Brook), 4) construction, deployment, retrieval and processing of standardized “rock bags” for collecting stream macroinvertebrates and calculation of Macroinvert IBI following Massachusetts State procedures, 5) field test of Maine State stream macroalgal cover (very little suitable substrate at our field sites), 6) electrofishing to sample fish community (id, total length and weight), 7) fish habitat and in-stream flow measurements.

Field session results have been summarized in two progress reports:

- Dionne, B. and H. Wilhelm. 2012. Merriland River and Branch Brook Watersheds Assessment of Ecosystem Integrity, NERRS Science Collaborative Progress Report February 2012 including 2011 Resin Bag (Nitrogen Inputs) Data, 2011 Rock Bag (Benthic Macroinvertebrate IBI) Data, and Land Use Index.
- Van Boer, A. 2012. MBLR Fish Data Analysis Progress Report. Wells National Estuarine Research Reserve, Wells, Maine. 7pp.

*Task I.2. Characterize Linkages between Ecological Outcomes, Ecosystem Services and Values.*

- Three focus groups have been held with residents of York County, ME (a total of 23 respondents). The goal of these focus groups was to (1) assess perceptions of ecological condition and change among the public, (1) assess ways in which these conditions changes relate to services and uses for which public values, and (3) characterize linkages between ecosystem service indicators and the preferences and perceptions of the public.
- Current and expected data and models from the ecological project component (characterizing such things as the effect of riparian land cover on nutrient loadings to neighboring water bodies) have been linked to these focus group results to begin development a conceptual model linking measurable ecological outcomes to ecosystem services valued by area residents.

*Task I.3 Develop Models for Estimation of Ecosystem Service Values and Tradeoffs.*

- Results of Task I.2 provided the basis for development of a model informing choice experiment questions and attributes. These choice experiment will enable the public

- to consider ecosystem service and other tradeoffs resulting from alternative treatments of riparian land. The current model (subject to further testing, development and refinement) enables quantification of tradeoffs and economic values (willingness to pay) related to measurable changes in: (1) the ecological condition of the riparian landscape measured using a land cover index; (2) influences of resulting changes in nutrient loading on the aesthetic and ecological condition of proximate water bodies; (3) effects on observable fish assemblages and abundance; (4) effects on wildlife species that depend on natural riparian areas; (5) changes to policies affecting land use and development; and (6) household cost.
- Numerous consultations have also been held between PI Johnston and other worldwide valuation experts working on similar coordination of economics and ecology within aquatic ecological policy contexts. These have occurred both through conference calls and in-person meetings (funded by other sources) at locations including the W-2133 meetings in Utah and the AARES (Australian Agricultural and Resource Economics Society) meetings in Perth, Australia. These consultations have informed (1) model development, (2) the definition and measurement of ecosystem services and related choice model attributes, (3) design of draft choice experiment surveys.

*Task 1.4. Develop and Test Choice Experiment Surveys.*

- Drawing from Tasks 1.2 and 1.3, an initial draft of the choice experiment survey was designed and tested in a focus group held on December 8<sup>th</sup>.
- This initial survey has been subject to extensive revision based on (1) results of the focus group, (2) comments of investigators on the project team, (3) further development of the coordinated ecological/economic model described above.
- A new, revised version of the survey should be completed on or around a project team meeting scheduled for March 5, with subsequent focus group testing to be scheduled during the spring.
- Preliminary plans have been developed for alternative survey implementation modes. These would include split-sample survey implementation: (1) using traditional, multiple-wave mail surveys, (2) in-person with respondents paid to attend meetings at the Wells NERR, at which surveys will be implemented, (3) in-person with surveys and audiovisual information mounted on laptop computers, and potential respondents intercepted in public locations. The advantage of the latter two implementation modes is a capacity to provide much more detailed information and instructions to respondents than would be possible with a mail survey alone.

*Task 1.5. Develop Sampling Plan and Implement Survey.*

*Task 1.6. Estimate Choice Experiment Models and Forecast Household Values.*

**Objective 2.** Coordinate social science and cognitive theory, principles of effective communication, local motivations for stewardship/conservation, and approaches for social learning to:

- a. Identify specific stakeholders most influential in affecting decisions, management and policy change affecting Wells NERR riparian areas addressed in Objective 1.
- b. Evaluate Wells NERR communication approaches to these identified stakeholders/stakeholder groups to assess the degree to which messages are in alignment with values and priorities identified in Objective 1;

- c. Develop high impact, science-based communication strategies and decision support tools—based on the ecological/economic results of Objective I—to inform integrated management of riparian area land use, habitat and nonpoint source pollution in watersheds draining into the Wells NERR region.

*Task II.1. Develop and Implement Communications Audit*

Stakeholder organizations and individuals were targeted and prioritized for involvement in various stages of data collection.

A few interviews were conducted with key stakeholder organizations to gain a better understanding of their methods for communicating riparian issues to different audiences, with particular focus on economic value and ecosystem services.

*Task II.2. Develop Mental Models and Test Cases*

Through research team discussions, we are learning more about the case and determining the best way for the communication and mental modeling work to support the economic valuation. We decided we'd like to find a data collection and analysis technique that allows us to do the mental modeling but also a social network analysis of stakeholders and their communication pathways between and among one another and their audiences. Based on this desire, we are in the process of weaving three mental modeling methodologies together to better meet our goals. These include qualitative modeling through interviews, stakeholder gathering to achieve collective mental models, and possibly field transect work.

**Objective 3.** Engage Wells NERR stakeholders, the Science Collaborative Team and the project's Research Team within a collaborative learning process to build long-term institutional and regional capacity for improved riparian management through a community of practice. Collaborative learning will be grounded in coordinated science, communication and decision support outputs of Objectives I and II.

**(See section B above)**

- D. Benefit to NERRS and NOAA: List any project-related products, accomplishments, or discoveries that may be of interest to scientists or managers working on similar issues, your peers in the NERRS, or to NOAA. These may include, but are not limited to, workshops, trainings, or webinars; expert speakers; new publications; and new partnerships or key findings related to collaboration or applied science.

Impact of project from the perspective of NOAA's Coastal Services Center team member Pete Wiley based upon progress to date and anticipated 2012 actions:

Information on how the public perceives ecological changes, how these changes effect the provision of ecosystem services, and a better understanding of how ecosystem services indicators can affect public perceptions (Task I.2), can help scientists and managers through a more explicit link between research results/management activities and desired outcomes measured through societal benefits.

The experience of model development using ecological, policy and household attributes (Task I.3) will enable similar models to be used in other reserve sites, but also for other management applications for NOAA and its partners.

- E. Describe any activities, products, accomplishments, or obstacles not addressed in other sections of this report that you feel are important for the Science Collaborative to know.

Members of the Wells NERR Collaborative Science Team including Christine Feurt, Annie Cox and Tin Smith are actively engaged in the Salmon Falls Watershed Collaborative. This partnership of governments, watershed groups, land trusts and water supply agencies includes stakeholders engaged in developing and implementing the NERRS Science Collaborative Project. On February 21, 2012 the Salmon Falls Watershed Collaborative was awarded the US Water Prize for 2012 by the US Clean Water America Alliance. The Collaborative was recognized for their innovative work developing strategies for sustaining watershed ecosystem services through partnerships. Members of this robust stakeholder network are key intended users for the results of this project. Members participated in activities identified in section B above.